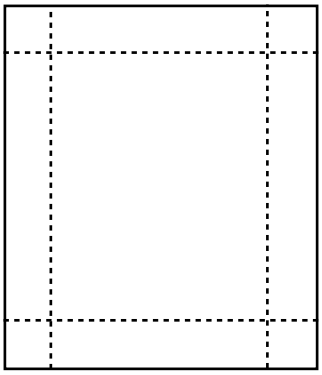
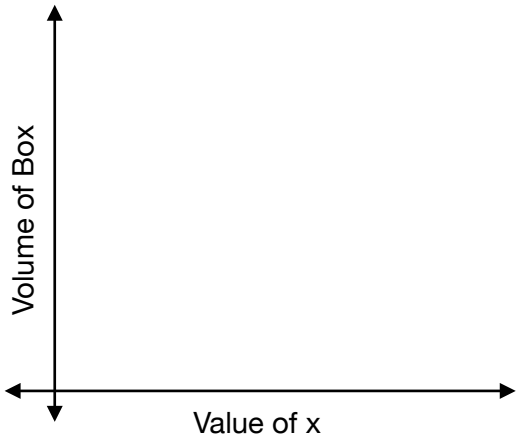
Function Applications and Particle Motion

Application: Box Problem

1. Sketch
2. Write everything you know about the problem
3. Combine to make a function in one variable.
4. Use function with technology to answer question

"A sheet of metal 12 inches by 10 inches is to be used to make an open box. Squares of equal sides x are cut out of each corner then the sides are folded to make the box. Find the value of x that makes the volume maximum."

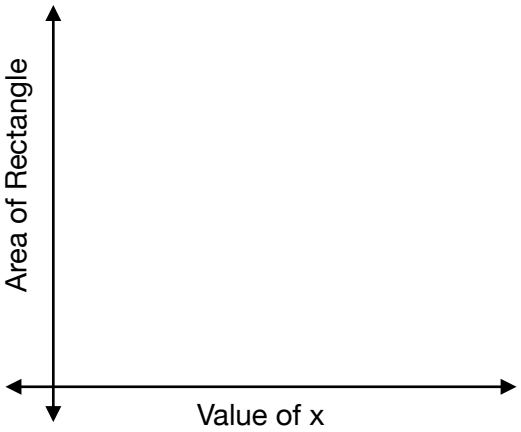




Application: Inscribed Shapes

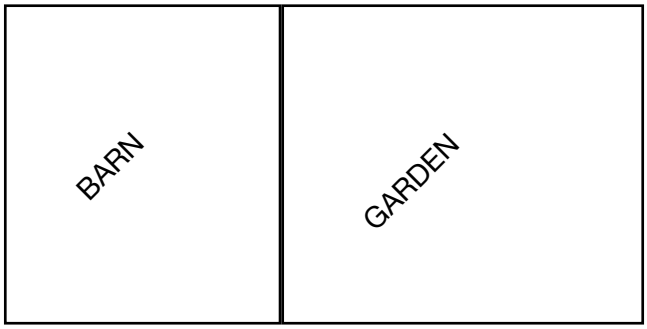
1. Sketch
2. Write everything you know about the problem
3. Combine to make a function in one variable.
4. Use function with technology to answer question

What is the largest area of a rectangle the can inscribed in the first quadrant and below the line $y = -\frac{3}{7}x + 9$

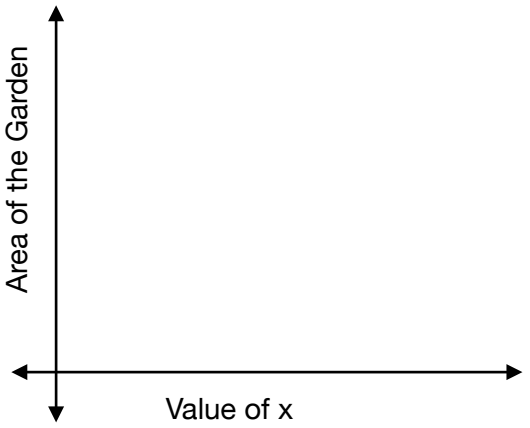


Application: Max Area Problem

1. Sketch
2. Write everything you know about the problem
3. Combine to make a function in one variable.
4. Use function with technology to answer question



A farmer plans to make a rectangular garden. One side will be against a long barn. He has 100 ft of fencing that he will use to surround the other three sides. What are the dimensions of the garden of maximum area?



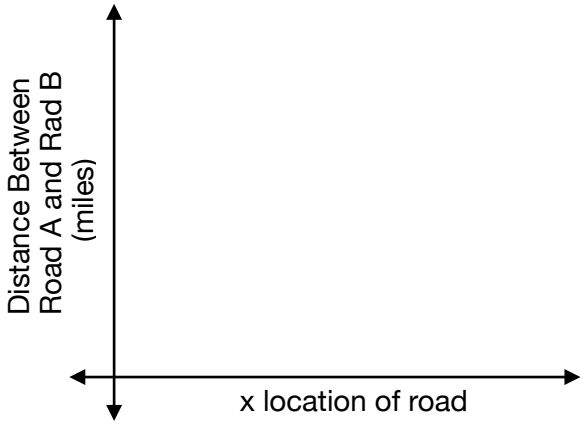
Application: Distance Between Curves Problem

An engineer has designed two roads that are positioned based on the following functions (measured in miles.)

Road A: $A(x)=\frac{1}{2}x+3$ Road B: $B(x)=-\frac{1}{4}(x+2)^2+1$

The engineer must build a vertical road joining Road A and B according to city ordinance. It has to be the shortest distance possible. That said, what is the shortest possible road that can be built between Road A and Road B? Write function you put in your calc as d(x). MAKE A SKETCH. SHOW ALL WORK. USE CORRECT UNITS FOR ANSWER.

1.Sketch
2.Write everything you know about the problem
3.Combine to make a function in one variable.
4.Use function with technology to answer question

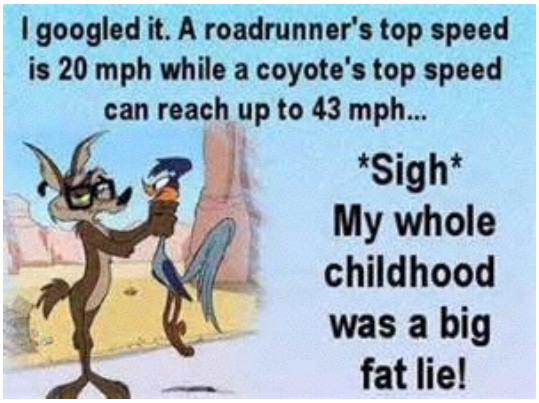


PARTICLE MOTION

By the end of this part of the lesson, I will be able to answer the following questions...

1. How do I solve Particle Motion problems as they relate to PHYSICS and CALCULUS.

2. What are the PHYSICS properties related to particle motion problems.



Position: The position of the particle with respect to time. Represented as s(t).

Velocity: The change in position with respect to time. Is directional. Represented as v(t).

Acceleration: The change in velocity with respect to time. Is directional. Represented and a(t).

Speed: The absolute value of velocity. Is not directional.

SPEED UP!!!!!

*acceleration and velocity have **the same** sign.*

SLOW DOWN!!!!!

*acceleration and velocity have **different** signs.*

The ***POSITION*** of a moving particle on a coordinate line is given by the function,

$$s(t)=t^2-3t-10$$

where t is measured in minutes and s(t) is inches.

The ***VELOCITY*** of a particle is $v(t)=2t-3$ where t is measured in minutes and v(t) is inches per minute.

The ***ACCELERATION*** of a particle is $a(t)=2$ where t is measured in minutes and a(t) is inches per minute squared.

Answer the following questions about a particle that moves on a horizontal coordinate line.

1. Where does the particle start?
2. When is does the particle stop?
3. Where does the particle stop?
4. When is the particle moving to the right/left?
5. When is the particle speeding up/ slowing down?

The ***POSITION*** of a moving particle on a coordinate line is given by the function,

$$s(t)=2t^3-7t^2+3t$$

where t is measured in minutes and s(t) is inches.

The ***VELOCITY*** of a particle is $v(t)=6t^2-14t+3$ where t is measured in minutes and v(t) is inches per minute.

The ***ACCELERATION*** of a particle is $a(t)=12t-14$ where t is measured in minutes and a(t) is inches per minute squared.

Answer the following questions about a particle that moves on a horizontal coordinate line.

1. Where does the particle start?
2. When is does the particle stop?
3. Where does the particle stop?
4. When is the particle moving to the right/left?
5. When is the particle speeding up/ slowing down?

The ***POSITION*** of a moving particle on a coordinate line is given by the function,

$$s(t)=-t^3+4t^2+t$$

where t is measured in minutes and s(t) is inches.

The ***VELOCITY*** of a particle is $v(t)=-3t^2+8t+1$ where t is measured in minutes and v(t) is inches per minute.

The ***ACCELERATION*** of a particle is $a(t)=-6t+8$ where t is measured in minutes and a(t) is inches per minute squared.

Answer the following questions about a particle that moves on a horizontal coordinate line.

1. Where does the particle start?
2. When is does the particle stop?
3. Where does the particle stop?
4. When is the particle moving to the right/left?
5. When is the particle speeding up/ slowing down?